Forest For The Future

A Report on Maine's Forest To the Legislature, the Governor, and the People of Maine.

"Jo-Mary Operation" by John E. McLeod (Fogler Library, University of Maine)

January 1988

John R. McKernan, Jr.
Governor

Robert R. LaBonta
Commissioner

DEPARTMENT OF CONSERVATION
Telephone (207) 289-2211

January 31, 1988

The Honorable John R. McKernan, Jr.
Governor of the State of Maine
Station #1
Augusta, Maine 04333

The Honorable Charles P. Pray
President of the Senate
Senate Chambers
Station #3
Augusta, Maine 04333

The Honorable John L. Martin
Speaker of the House of Representatives
House of Representatives
Station #2
Augusta, Maine 04333

Members of the 113th Legislature
State of Maine
Station #2
Augusta, Maine 04333

Dear Governor McKernan, President Pray, Speaker Martin,
and Members of the 113th Legislature:

This first major report by Forests For The Future is an important early step in an ongoing process. It achieves major significance as it assesses more comprehensively than ever before the status of Maine's forests today and then utilizes modern computer modeling methods to project potential growth and demand.

Participation in the development of the report has been remarkable for its breadth, its diversity and its dedication. Especially notable has been the contribution of the Citizen's Advisory Council. Seven people with diverse backgrounds and interests persevered in their advisory role through the many frustrations of trying to pull together a fair and objective report on a most complex subject. To a person, they supported the broad challenge before them and diligently worked to bring varying interests together constructively.

Data for some aspects of the study were less firm than desired. That probably is true of most studies, and projects must proceed with the best data available. Some of the recommendations in this report are designed to strengthen data for future use.

Susan J. Bell, *Deputy Commissioner*/Janet E. Waldron, *Director*, Administrative Services
State House Station 22, Augusta, Maine 04333 — *Offices Located at* AMHI, Harlow Building

In transmitting this report to you, two commitments are implicit. First, the recommendations call for actions that are achievable. Most of the actions fall within the jurisdiction of the Department of Conservation. The Department is accountable for their achievement. Second, all participants involved recognize Forests For The Future as an ongoing project, as the statute clearly indicates. There is much work to be done.

Finally, though there is no objective comparative measurement available, there is little doubt that this report, along with the studies which back it up, is the most comprehensive study and analysis of forest resource ever made in the United States. It seems appropriate that Maine is the leader in this, for in no other state does the forest assume such a dominant role. Not only is a higher proportion of Maine's land occupied by forest than in any other state, but the forest products industry's contribution to the total State economy is higher in Maine than in any other state.

Please find time to read this first major report from the Forests For The Future program. Both the Executive and Legislative branches of Government will play key roles in the real future of Maine's forests, as will the thousands of private owners of the forest who must meet established public interests while achieving their own diverse objectives of ownership.

Respectfully submitted,

Robert R. LaBonta
Commissioner

gr

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Forest Management
Great Northern Paper Company
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Staff

James F. Connors, Director
Forests for the Future Program

In addition to the Citizens' Forestry Advisory Council and Forests for the Future Program staff, a great many people contributed to the preparation of this report. Technical advise and assistance was provided by a diverse group knowledgeable in forest resources including staff from the University of Maine, forest industry, environmental organizations and various state agencies representing expertise in forest management, forest utilization, recreation, land use regulation, wildlife and fisheries, watershed management, research, and economics. A report of this magnitude cannot be successfully completed without the competent help of many supporting personnel, especially the administrative staff, and many others who helped simply by performing their daily tasks. Heartfelt thanks to all.

JFC

HIGHLIGHTS

- Maine ranks first in the nation in the percent of the economy that is forest based. The outlook for the Maine forest products industry remains strong.

The forest:

- produces more than 500 economically valuable products.
- employs 33,000 Maine workers.
- provides a self-renewing energy resource.
- contributes more than $4 billion to the Maine economy.

- Maine has an inventory of 22 billion cubic feet of standing wood. The forest has sustained continuous harvesting for centuries and continues to meet the need for wood.

- A Maine Forest Service survey confirmed that natural regeneration of the forest following timber harvesting is still a reliable method of establishing the next stand of trees.

- As the demand for wood grows, the potential for wood shortages increases. To meet possible future shortages, more intensive forest practices must be employed to improve growth, including planting when needed, releasing valuable young trees from competing vegetation, and controlling the density of forest stands.

- Over the last five years, intensive forest practices designed to improve growth and eventual yield have been applied to more than 170,000 acres of industrial forest land in Maine.

- Better information about Forestry is needed. The exact amount of wood harvested and acreage affected is unclear, limiting the ability to predict the adequacy of future wood supplies and the timing of potential short falls.

- A new sophisticated computer modeling program reveals that potential wood shortages are further in the future and not as severe as previously forecast. This more favorable outlook results from the sudden demise of the spruce budworm and the increased application of intensive forest management.

- Controversial forest practices, including clearcutting, were examined by the CFAC and staff during this study. Clearcutting can be a powerful tool for improving the forest when adequate forest regeneration is ensured and the resulting forest is managed to enhance growth.

- The Maine Forest is very diverse, providing habitat for wildlife. This diversity is important and needs to be carefully monitored. Significant wildlife habitats, such as deer yards and certain shoreland areas, require continuing special management.

- Wildlife abundance and variety are influenced by harvesting. A number of desirable wildlife management techniques have been identified to maintain and enhance wildlife habitats.

- Over 80% of Maine residents participate in some form of wildlife related activity, including hunting, fishing and nature appreciation. General recreational use of the forest increases about 5% per year, creating new pressures on the resource and contributing to land use management difficulties. Private forest lands will continue to provide outdoor

recreational opportunities, but landowners will increasingly have to manage recreational use.

- Outdoor recreation contributes over 700 million dollars to the Maine economy and is a growing segment of the State's tourism industry.

- Maine's soil and water resources are adequately protected when existing laws and regulations are strictly and uniformly enforced.

- This study will prompt significant action by the DOC to implement a number of recommendations under existing laws and programs. The FFP with the CFAC will initiate additional studies on key issues and recommend further action where appropriate.

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INTRODUCTION

In 1985, the 112th Maine Legislature, recognizing the increasing demands upon Maine's forests, established the Forests for the Future Program within the Department of Conservation (Chapter 488, Public Laws of 1985). The legislation creating the Forests for the Future Program expressed three basic concerns.

1. Can Maine's forests continue to provide all of the amenities demanded by society?

2. How can Maine's forests be managed to assure continued availability of resources?

3. What is the State's role in encouraging and promoting conservation of forest resources?

To help address these questions, the Governor appointed a Citizens' Forestry Advisory Council. The Council assisted by defining studies; conducting public hearings, inspecting forest lands and industrial plants; and carefully considering the economic and ecological ramifications of changes in timber production, wildlife management, recreation, soil and water protection and forest policies. The Council participated in the preparation of this report and suggested responses to the issues raised by the Legislature.

The Council, the Department of Conservation and the numerous other individuals and agencies involved in the Forests for the Future Study have attempted to meet several objectives set forth in the legislation. Foremost among these are:

1) Assessment of the current status of forest resources, including timber, fiber, recreation, water, wildlife and soil;

2) Prediction of future demand for these resources, using a common economic forecast developed by the State Planning Office;

3) Identification of trends in resource utilization and a forecast of supply availability to meet the projected demand.

4) Clarification of potential shortfalls in forest resources, and the identification of the management actions necessary in the public and private sector to avoid them; and

5) Preparation of recommendations to the Governor and the Legislature for refining or redirecting state programs and stimulating private sector actions to ensure an adequate supply of natural resources.

Five reports were commissioned to provide answers to these questions. These reports form the basis of this study; interested readers desiring more information about the future of Maine's forest resources are directed to them.

The five reports are summarized below.

1) *The Forests of Maine - Yesterday, Today, Tomorrow* - This report, prepared by Sherman Hasbrouck of the University of Maine's Land and Water Resources Center, describes Maine's forest, the ways it has been shaped by man and nature, and its importance for the people of Maine. The report outlines the current status of Maine's forest resources, including pulpwood, lumber, and other wood products, energy, wildlife habitat, recreation, and watershed protection. It traces the history of the forest industry, describes ownership patterns, and examines the possibility of wood supply shortfalls. Finally, it recommends ways to establish a "new forest" for Maine.

2) *The Forest of Maine, A Survey of Public Opinion* - This report was prepared by Northeast Research Inc., specialists in telephone opinion polls. The poll's major findings are: Maine people are concerned, but often poorly informed, about the forest; timber harvesting engenders the most concern; and Maine citizens are also worried about the availability of land for recreation and wildlife habitat. Clearcutting, pesticide use, and acid rain are other principal concerns. The public generally accepts the view that the forest are well managed , but that state government should do more to address problems facing the Maine forest.

3) *Demand for Forest Products* - Keith Balter and Johan Veltkamp of Resource Information Systems, Inc. prepared this report to predict the demand for forest products produced in Maine using Maine grown wood. They find that demand will continue to be strong well into the next century, although the demand for raw materials will be influenced by available supply and technological adaptations. The most significant product forecasts are:

Paper

"Maine has proven to be a good area to make lightweight coated papers as evidenced by its huge market share in these grades today.

This is a high growth market with a positive long-term outlook . . . and the Maine producers are the major companies in this market."

Pulp

"Although pulp production is projected to increase over the next 15 years, the growth will be slower than the expansion of Maine's paper industry."

Softwood lumber

Softwood lumber production in the Northeast will be affected by the general slowdown in residential construction and the demand for softwood lumber in the region will average below current levels between now and the turn of the century."

Hardwood Lumber

"In the forecast period a number of factors should support continued moderate increases in the Maine hardwood harvest . . . Therefore we are projecting that hardwood sawlog consumption will rise . . ."

Structural panels

"In the 1990's demand for reconstituted structural wood panels will continue to expand at a rapid rate, and production in the Northeast will grow accordingly."

Residential fuelwood

". . . the percentage of Maine households using wood and the per household consumption of fuelwood will continue to drop. In the 1990's an expanding population and increasing energy prices will reverse this downward trend . . ."

Commercial and Industrial fuelwood

". . . between 1991 and the year 2000, growth in commercial and industrial fuel wood demand should be rather subdued . . . However . . . the stated policy objective of the State of Maine is to encourage . . . greater expansion of wood fueled electrical generating capacity . . ." As this is the case the overall drain on Maine's wood resources could be considerably increased."

4) *Timber Supply Assessment* - This report was prepared by Dr. Robert Seymour, and others at the Cooperative Forestry Research Unit, University of Maine, Orono. Seymour sought to determine the sustainable harvest level for the five major tree species groups, (spruce-fir, shade-tolerant hardwood, aspen-white birch, white pine, and hemlock) prominent in Maine.

He has concluded that although there are important differences among the individual species groups, in general wood harvesting cannot continue at its current level. He does believe that current and future efforts to improve forest productivity can result in significant increases in wood supply.

5) *Economic Value and Use of Fisheries and Wildlife Resources* - This report was prepared by Dr. Kevin J. Boyle, Assistant Professor, and Vivki A. Trefts and Parnel S. Hesketh, Research Assistants at the Department of Agricultural and Resource Economics, University of Maine. The report confirms that fish and wildlife resources are important to Maine's economy and that they are an integral part of Maine's way of life, with over 80 percent of Maine's residents participating in wildlife related activities. These activities are themselves a vital component of Maine's economy, providing jobs and income for Maine residents. Expenditures in excess of 200 million dollars in 1987 documented for hunting and fishing alone, only part of the economic contribution of wildlife to the economy of Maine. These expenditures also generate additional dollars, and jobs, in other segments of Maine's economy.

These five reports, prepared under the auspices of the Forests for the Future Program, were essential to the completion of this report. Several other key documents, such as the Maine Forest Service's Mid-cycle Survey Report, the Bureau of Parks and Recreation's preliminary SCORP the Department of Inland Fisheries and Wildlife Strategic Species Plans, and the USDA Forest Service's "Forest Statistics for Maine," were also used extensively. These reports are cited throughout the text and may be consulted for more detailed information.

Report Organization

This report is organized to reflect the structure of the legislation that created the Forests for the Future program. Each of the forest resources recreation, and water and soil are considered in sequence. The report examines the current status, the future supply and demand, and any potential shortfalls for each resource.

After all resources have been discussed, the goals for each group - and the Maine Forest itself - are presented, and the action steps necessary to achieve each goal set forth.

FOREST PRODUCTS

Current status

The Maine Forest provides raw materials for pulp and paper, lumber and other forest products, energy, wildlife habitat, recreation, and watershed protection. With a manufactured product value of over $4 billion, the forest industry is the largest single contributor to Maine's economy.

With approximately 17 million acres of forest land, 89 percent of the total land area, Maine remains the most heavily forested state in the country.

Situated between the boreal forest of Canada and the central hardwood forest of the eastern United States, Maine's forest is a rich mixture of broad-leaved hardwoods and coniferous softwoods. Local influences such as soil type, drainage, slope, microclimate, and land use history affect the composition of the forest. Thirty-five percent of the timberland, 5.9 million acres, is in the spruce-fir forest type. Another 40 percent, 6.7 million acres, is in various hardwood types, while the remaining 25 percent consists of mixed wood and other softwood types (Table 1 and Figure 1).

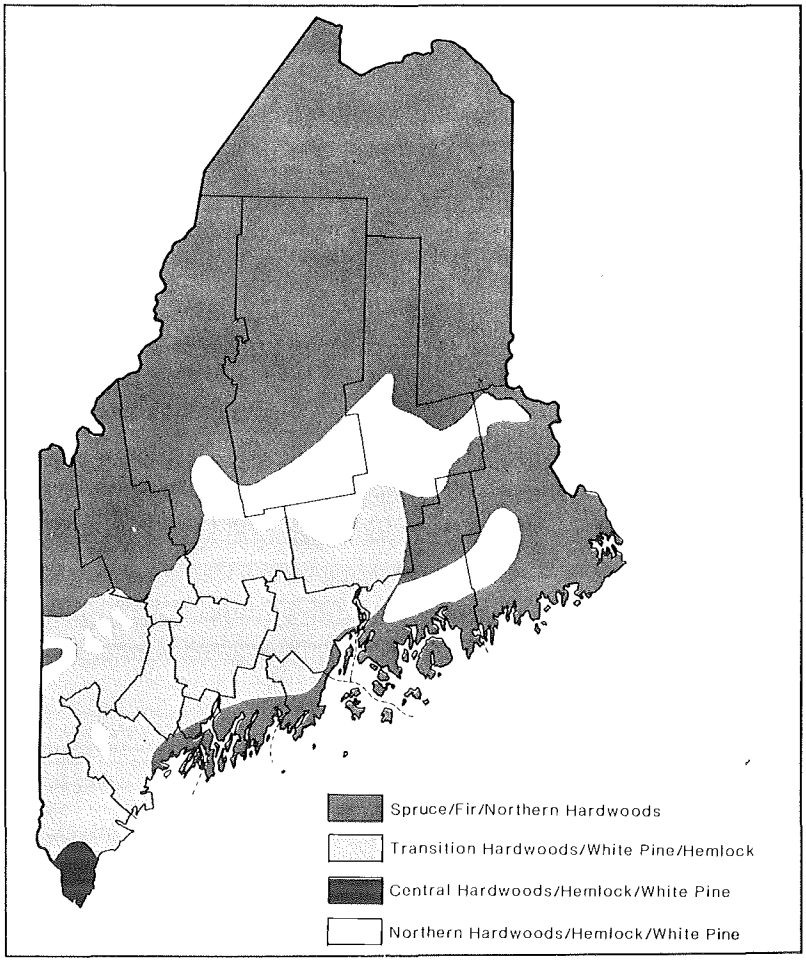


Figure 1. Natural Forest Vegetation Zones
Source: Society of American Foresters

The acreage in each forest type remains fairly constant over time, generally controlled by environmental factors. Forest types tend to replicate themselves following harvesting or other disturbances, although the species composition may vary. In recent decades forest surveys reveal measurable changes in species composition, especially an increase in the volume of so called low grade hardwoods. This trend has been a concern, because these species - red maple and aspen - were considered undesirable for commercial uses. Today, new technologies and new markets, such as for waferboard and biomass energy, are creating a demand for low grade trees and also providing an opportunity to improve woodland management.

Each forest type can be classified into age classes, reflecting the age of the trees within the type. The distribution of age classes is an important measure of how rapidly the current forest is growing, how much

wood will be available in the future, and what mix of products can be produced. Younger stands normally grow faster than old ones, so a given acreage will grow more wood if it is in younger age classes. Of course, trees must reach a minimum size before they can be used for certain products, and some products require older (larger) trees than others.

Description	Principal Species	Area (ac)	% of Total
1) White Pine	White Pine, Eastern Hemlock	1,527,099	9.1
2) Hemlock -Upland Conifer	Eastern Hemlock, Jack Pine, Red Pine	654,249	3.8
3) Cedar-Larch	Northern White Cedar, Tamarack	1,708,335	10.2
4) Spruce-fir	Balsam Fir, Red Spruce, White Spruce, Black Spruce	5,938,052	35.3
5) Tolerant Hard-wood	Red maple, American Elm, White Ash, Black Ash, Green Ash, Sugar Maple, American Beech, Yellow Birch, Black Cherry	5,049,312	30.0
6) Intolerant Hard-wood	Aspen, Paper Birch	1,431,011	8.5
7) Oak -Pine	White Pine, Pitch Pine, Northern Red Oak, White Oak	262,638	1.6
8) Old-field Hard-wood	Pin Cherry, Gray Birch	245,067	1.5
Total, All Commercial Timberland in Maine		16,815,763	

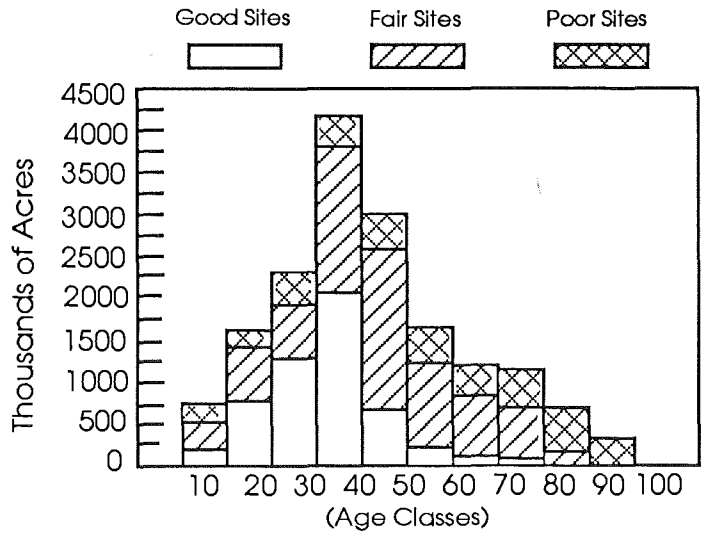
* Commercial timberland is all forest land from which timber may be harvested. It includes all public and private woodlands, both industrial and nonindustrial, where timber harvesting is not prohibited. It does not include forested acreage in Acadia National Park, Baxter State Park, and the Allagash Wilderness Waterway. These noncommercial forest lands total an additional 272,000 acres, bringing the total forest area in the state to 17,607,400 acres.

TABLE 1: Forest Types of Maine.
Source: Forest Statistics for Maine, 1971 and 1982; projections of Timberland Supplies in Maine; Preliminary Report of the 1986 Midcycle Resurvey of the Spruce-Fir Forest in Maine.

When the age class distribution is balanced evenly throughout the forest, the amount of wood that can be harvested and the range of products that can be manufactured remains relatively constant. The present age class distribution in Maine is not evenly balanced (Figure 2). There is an ample supply of older trees which provide timber for sawlogs and pulp, but these trees cannot be expected to remain vigorous well into the next century. Eventually, Maine will need a new supply of mature trees, especially for traditional sawlog products. These trees must come from age classes that are not yet mature.

Figure 2. Age Class Distribution

Source: Projection of Future Timber Supplies in Maine



The quickest way to enable these stands to become harvestable is to apply silvicultural practices, such as thinning crowded stands and releasing trees from competing vegetation, to encourage more rapid growth. Tree quality is also a serious concern at present, especially in hardwoods where only 57 percent of the standing volume is sound, the rest being rough, rotten, cull, or dead. These unsound trees can be used for low value products, such as fuel and are valuable as wildlife habitat, but they too often occur in high concentrations on poorly managed sites. Both forest product quality and wildlife would benefit if snags and large trees were more evenly distributed, with a corresponding improvement in overall tree quality. In the past, limited markets and individual economic considerations often meant the removal of the best quality trees and the most desirable species, leaving a low quality seed source. Furthermore, many of the less valuable species sprout from the roots and stumps of harvested trees, outcompeting small seedlings. These sprouts often are more poorly shaped than trees started from seed. In general, the same management practices that will increase wood supply, especially thinning, will also improve tree quality.

Protection of the forest from insects, disease, and fire is also essential to sustaining future wood supply. Even though these phenomena are natural components of the forest's ecology, they can seriously affect forest productivity. Silvicultural systems work best when they anticipate natural disease or insect cycles, thereby offsetting these disturbances. For example, harvesting trees before they become overmature will lessen the likelihood of some disease and insect outbreaks. When outbreaks do occur, appropriate pest management practices may be necessary if wood supply is threatened.

Historically, the spruce budworm has been the most significant debilitating influence on Maine's spruce-fir forest. Natural cyclic outbreaks occur regularly, causing widespread mortality of spruce and fir. These are likely to continue in the future. Their impact can be lessened by protecting the forest when budworm populations reach epidemic proportions. Protection of residual forest stands from damage during harvesting activities is another key element in maintaining the productivity and value of managed forests. Logging equipment and harvest systems matched to the forest conditions and coupled with careful planning and supervision are necessary to assure desirable results.

The effects of air pollution and acid deposition on tree growth are still unresolved, but available data do not indicate any widespread decline in Maine's forests at this time. There is a clear cause for continuing concern, however.

An equally important aspect affecting the condition of the forest is the complex pattern of ownership. Most of the forest, 96 percent, is privately owned; the other 4 percent comprises Maine's public lands including the national forests, parks, and wildlife refuges; and the state parks, wildlife management areas and public reserved lands, (Table 2).

Table 2: Timber Land Ownership in Maine

Ownership Class	No. of Owners	Total Acres (Thousands)	Percent of State Total
Forest Industry	300	8,016.9	47.0
Farmer	17,100	1,306.5	7.6
Individuals	149,500	4,003.9	23.5
Corporations (non-forestry)	1,700	572.4	3.3
Other 1	12,300	2,470.4	14.5
Total Private	180,900	16,370.1	96.0
Total Public		690.1	4.0
All Timberland		17,060.2	

1 Includes undivided estates, partnerships and trusts.

Source: Forest Land Owners of Maine

Forest management companies, including both paper and lumber producers and land management firms, oversee the "industrial forest", which is managed primarily for forest products. Most of the industrial forest is located in northern and eastern Maine, but there are also many parcels of industrial forestland in central and southern Maine, although in general these portions of the state are segmented into smaller, nonindustrial ownerships, (Figure3).

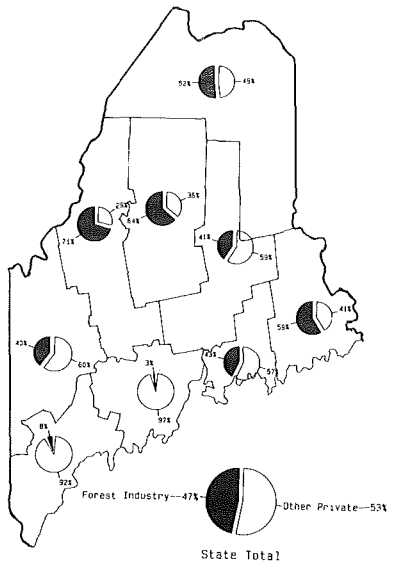


Figure 3. Percentage of Forest Land Owned by Forest Industry in Maine.
Source: Forest Land Owners of Maine, 1982

Many of the nonindustrial parcels are managed too, but some receive little or no attention. The USFS obtained a rough estimate of the amount of nonindustrial privately owned land that has received some management attention by surveying individual landowners (Birch 1986). Approximately 34,000 nonindustrial landowners, accounting for 4.6 million acres, have at least once sought professional assistance in man aging their land (Table3)

Table 3: Nonindustrial Private Landowners Who Have Sought Professional Assistance In Mainaging Timberland

	No. of Owners	Acres Owned
Sought Assistance	34,000	4,591,100
Did Not Seek Assistance	140,900	3,462,400
No Answer	5,700	299,700
Totals	180,600	8,353,200

Source: Forest Landowners of Maine

Another 140,900 owners have never sought assistance; they represent another 3.5 million acres. Thus the majority (75%) of timberlands receives some level of management.

Of course, simply seeking or employing professional assistance does not guarantee that the timberland in question will actually be well managed; nor does it guarantee against subsequent abuse, such as high-grading or soil erosion, if the forester's advice is not followed.

Another indication of the interest of private landowners in forest management is participation in the American Forestry Association's Tree Farm program or the Small Woodlot Owners Association of Maine. Both of these organizations promote good forest practices and participants are most likely to be owners who already have a desire to manage their forests. There are about 1,640 nonindustrial members of the Tree Farm Program and 750 members of SWOAM. They account for approximately 650,000 acres and 762,500 acres respectively, though there is probably some overlap. Small woodlots are held for a variety of purposes. Nevertheless, even unmanaged lands provide raw materials for forest industries, wildlife habitat, watershed protection, and recreational opportunities, often close to Maine's population centers.

Supply and demand

Maine's forest resource is so large that it has historically grown more wood than has been cut. Most commercial species of trees grow rapidly under good conditions, and the supply of raw materials has usually kept pace with demand. As a result, it has not been necessary to manage

individual stands intensively. It has been more cost effective simply to cut timber and allow natural forces to shape the regenerating stands than to perform expensive management practices. As long as the supply exceeded demand, this harvesting system worked adequately. There is, however, a limit to how much wood the forest can grow, and evidence that demand for some products will outstrip supply.

There is, regardless, an enormous amount of wood in the Maine Forest— more than 22 billion cubic feet. This amount of wood is some 31 times larger than the amount estimated to be taken from the forest each year. There is adequate wood for the forseeable future. Sustaining the yield from the forest—ensuring a "sustainable yield"—depends on the growth of wood in the forest, not upon the volume of wood present. For the long run, the amount of wood cut must be balanced with the amount of wood grown. (Figure 4)

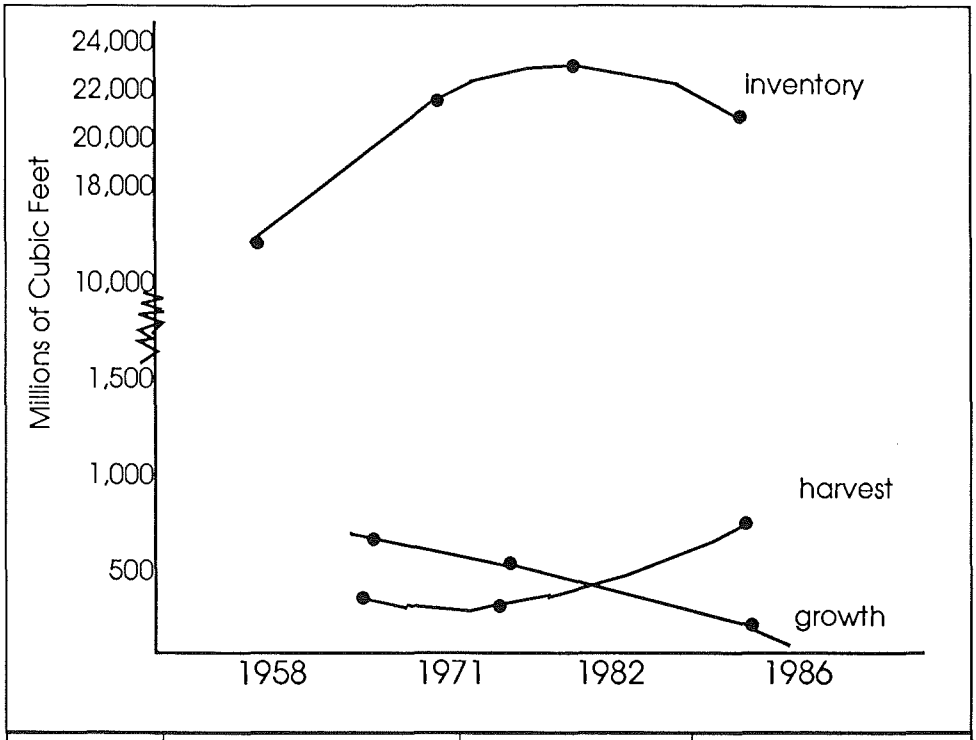


Figure 4. General Trends In Forest Inventory, Growth and Removals In Millions of Cubic Feet of Wood.

Source: Maine Forest Service

	Growing Stock Inventory	Average Annual Growth	Average Annual Removals
1958	16,500,000		
1971	21,253,000	710,800	408,700
1982	22,796,000	471,587	349,550
1986	20,863,000	233,800	664,700

By assessing the biological potential of the forest, it is possible to project the potential supply of raw materials. Current growth rates are generally depressed, largely due to an imbalanced age class distribution. Recent surveys reveal that much of Maine's forest is dominated by older, slow growing trees. The recent budworm outbreak affected many spruce and fir trees so severly that the surviving trees have grown slowly. With the cessation of the outbreak, young spruce and fir trees appear to be resuming normal growth. Growth rates are based primarily on biological factors, but these factors can be influenced by forest management. Stands that are intensively managed can grow three times the amount of wood that natural stands can produce.

Growth rates of all our tree species could be greatly improved by releasing them from competition or controlling stocking density. Native species, particularly the commercially valuable softwoods, are well adapted to Maine's climate and exhibit excellent growth rates on good sites, provided they are properly spaced and not overmature.

Landowners have responded to predictions of a wood shortage by increasing their efforts to plant, release and thin forest stands. Over the 5 year period, 1982-1987, there have been over 29,000 acres planted and 143,000 acres weeded, thinned or released by chemical or mechanical treatments (Table 4) on large industrial and nonindustrial ownerships. Data on small nonindustrial ownerships is incomplete and not included in these totals. Most of this acreage is in softwood and represents only two percent of the total spruce-fir acreage.

TABLE 4
Precommercial Silvicultural Activities in the Maine Forest for the Period 1982-1986*

Silvicultural Activity	Acres
1. Planting	
Hand planting	29,505
Machine planting	76
Aerial seeding	56
TOTAL PLANTED	29,637
2. Weeding or Precommercial Thinning	
Chemical treatment (herbicides)	128,933
Mechanical treatment (saws or machines	14,348
TOTAL WEEDED OR THINNED	143,281

* Only data from large ownerships are reported here. Data from other ownership categories is incomplete. There is the potential for some overlap in acreage reported. For example, acres planted in 1982 may have been released by herbicide treatment by 1986.

High yield management is most effective on productive sites, i.e., those with fertile, well drained soils. The basic components of high yield management are careful harvesting of the mature forest and simultaneous culturing of a new forest. Harvesting and other forest practices must be performed so as to extend the availability of wood for as long as possible from the old forest while accelerating the availability of wood from the new.

This will require a balanced approach to harvesting and management. In some areas, clearcutting will be the most silviculturally sound approach; in other areas, other cutting techniques will be more appropriate. The decision must be based upon the age, condition and composition of the stand; the presence, distribution and composition of regeneration; and the objectives of the landowner.

While clearcutting may seem to be incompatible with extending wood supply, it isn't. Clearcutting does liquidate a stand, but it is often the only way to capture all of the stand's present wood supply without inviting subsequent losses to insects, disease, and wind throw. It can also be the best method to establish a new stand.

An assessment of harvesting practices on large ownerships reveals that, between 1982 and 1986 a total of 1,031,012 acres were harvested. Of these 467,884 acres (45%) were clear-cut, while the remaining 563,128 acres, (55%) were harvested by partial cuts. The partial cuts consisted primarily of shelter wood, diameter limit, and single tree selection cuts.

In 1986, the Maine Forest Service conducted a survey of the spruce-fir forests of Maine and obtained data on removal rates and forest regeneration.

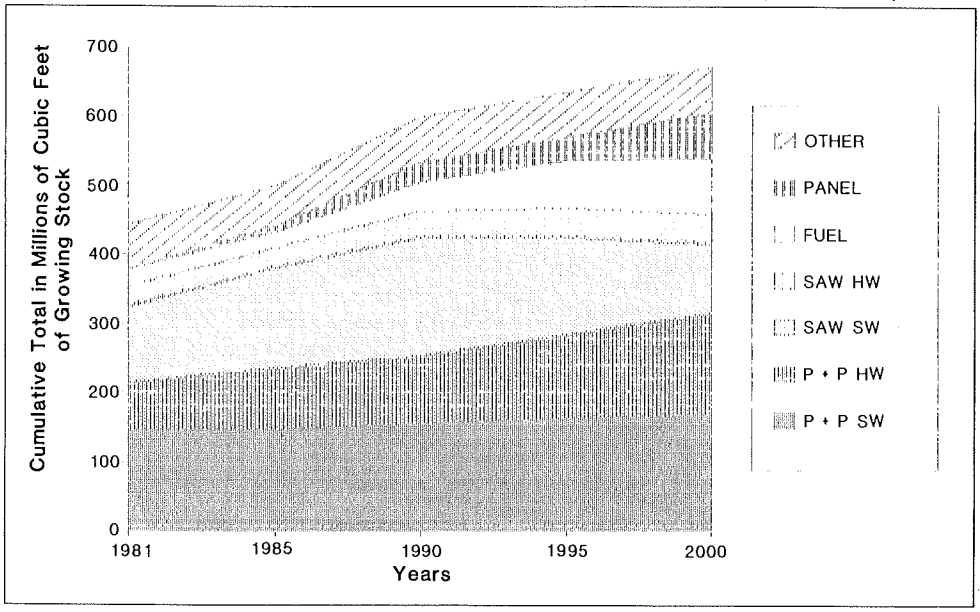
Even though the survey concentrated on the spruce-fir forest type, enough data was collected for other forest types to indicate that the statewide annual removal rate for all species was close to 720 million cubic feet. There is a margin of error in these estimates, the removal rate could be as high as 890 million cubic feet or as low as 645 million cubic feet. If the actual value is close to the low end of this range, current harvest levels can be sustained for a longer period than they could if the true value lies nearer the high end of the range. The need for collecting more complete information about removal rates is obvious. This survey also demonstrated that harvested areas are adequately

regenerating with new crops of young trees. In fact, 85% of harvested areas support at least 80% of full stocking.

The spruce/fir forest types are dominated by spruce and fir regeneration, but there is also a high portion of hardwood regeneration present. Some of the regeneration, approximately 10%, is overtopped and suppressed. Silvicultural treatment could benefit many of these sites by releasing the desirable young growth if they are to reach merchantable size in less than 60 years. In the hardwood type, as well as all other types combined, hardwood regeneration predominates, although there is a good admixture of spruce, fir, and other softwood. Harvest levels are influenced by biological factors. Usually, however, economic factors exert more influence. The demand for forest products is determined by the free market economy, so harvest levels are usually based on the amount of wood needed to supply the mills.

The marketplace demand for forest products produced in Maine from Maine grown wood is strong and is expected to be strong well into the next century (Balter and Veltkamp 1987). Pulp and paper, lumber, structural panels, and energy will remain the most important products (Figure 6). Demand will be influenced to some degree by available supply and technological adaptations.

Figure 6. Forecast of Demand for Forest Prducts by Major Industry and Species Group



Source: Report on the Demand for Maine Forest Products

There will also be a change in the proportion of the demand met by hardwoods and softwoods.

Given this information, what is the outlook for the future supply of wood from the Maine forest? Seymour, using a sophisticated forest management one hundred years (Seymour 1987). The sustainable harvest level for the five major species was determined. His study shows that the forests of Maine, as they are now being managed, cannot sustain harvests at the average 1980-1986 levels, nor will they be able to meet fully projected demand levels.

There are important differences for individual species groups and there are differences by product as well (Table 5b). For example, the data shows that the total sustainable harvest of spruce-fir is less than the current harvest rates indicating that there will be a shortfall of spruce-fir if demand remains at current levels. On the other hand, the total sustainable harvest of Aspen-White Birch is greater than current harvest levels, an indication that this species group is under utilized. Since the demand study (Balter & Veltkamp 1987) projects that demand for Aspen-Birch after the year 2000 will still be less than the sustainable harvest level, the potential exists to develop new markets for aspen-birch. The development of markets for under utilized species will encourage landowners to include these species in their management plans. Seymour's wood supply study highlights the

opportunity to increase the supply of forest products rather than restricting demand with the goal of meeting at least the minimum level of projected demands. This requires two approaches; retaining productive commercial forest land and increasing forest productivity. Retaining the commercial forest base is especially important in the rapidly developing regions of Maine. Any removals from

Table 5: Comparison of Sustainable Harvest* with Current Harvest Levels

a. Total Volume (1000 Cord Units)

Species	Sustainable Harvest (After the Year 2000)	Current Harvest** (1980-1986 Annual Average)
Spruce Fir	2,844	3,346-5,067
Tolerant Hardwood	1,688	1,815-2,285
Aspen-White Birch	1,163	661-994
White Pine	537	736-1,093
Hemlock	392	341-497
TOTAL	**6,624**	**6,899-9,936**

b. Saw Timber Volume (1000 Cord Units)

Species	Sustainable Harvest (After the Year 2000)	Current Harvest (1980-1986 Annual Average)
Spruce-Fir	940	1,403-2020
Tolerant Hardwood	590	190-274
Aspen-White Birch	210	134-193
White Pine	350	530-763
Hemlock	200	146-210
TOTAL	**2,290**	**2,403-3,460**

*Sustainable harvest is the amount of wood that can be consistently removed from the forest on an annual basis without depeleting the timber resource. The year 2000 is used as a base year to allow time for establishement of the new forest.

**Because of undertainty about current harvest levels, a range is given. The actual value lies somewhere between those values.

the commercial forest base, such as land lost to development or areas where harvesting is restricted, will result in roughly proportional decreases in annual sustainable harvest. Besides being valuable as timberland, woodlands under development pressure are often close to major markets, so transportation. costs are lower and marketing potential is greater. As more and more land is lost to housing, shopping malls, and parking lots, the remaining woodlands become even more important for wood as well as recreation, watershed protection, wildlife habitat, and scenic values.

The other way to ensure a sufficient supply of raw material to meet the demand for forest products is to increase the productivity of the forest. This can be accomplished, as noted above, by placing some acreage under high yield management and applying minimum standards of productivity and abuse prevention on the remaining acres.

Seymour (1987) has identified the forest management practices that will best enable Maine and increase its supply of forest resources. These are:

1) **Establish the "new" forest.** This must be done by assuring that a new forest is established on harvested sites. Both clearcutting and partial cutting are appropriate forest harvesting techniques, but neither is adequate unless regeneration of a desirable new forest is ensured by leaving well stocked stands of young trees on the harvest site, planting the site to an appropriate species, or through a combination of both.

2) **Release suppressed stands of commercially valuable species.** Much of the Maine forest consists of stands of young, commercially valuable trees that are "overtopped" by shrubs or poor quality trees. By removing the shrubs and rapidly growing intolerant hardwoods that often dominate a harvested area, the process of succession can be accelerated and

commercially valuable trees produced more quickly than in an unmanaged stand. This will enable the young age classes, which make up the new forest, to reach harvestable size sooner alleviating at least some of the supply shortfall that may result from the current dearth of stands in the 20 and 30 year age classes.

3) **Thin overstocked stands.** To reach their potential, trees must be free to grow. In a dense stand, trees will not grow as large nor as quickly as they will in more evenly spaced, uncrowded stand. By thinning dense stands, more of the growth can be captured before it is lost to mortality, and the remaining trees will grow faster and better. Diseased and poor quality trees can also be removed during thinning. Thinning must be carefully conducted to avoid damaging the remaining trees.
For the long term, there must be a commitment by woodland owners and managers to increase the amount of land under high yield management, with an emphasis on growing sawlogs. This type of management must ensure forest regeneration after harvest, the release of suppressed trees, and the thinning of stands to optimum stocking levels. Meeting the projected demand for spruce and fir requires that the level of intensive management in the spruce-fir forest increase dramatically from the current level of about 34,000 acres per year (Table 6). This assumes that growth on non-intensively managed land will remain stable. The sooner sites are brought under high yield management, the sooner they will be available for harvest.

Sophisticated forest management entails the use of many tools, ranging from the traditional to the most modern. Woodsmen equipped with small brush saws may thin acreage that, decades later, will be harvested by fully mechanized feller-bunchers, machines that quickly cut, limb and stack trees under the direction of a single operator. Some management practices may be controversial: clearcutting, pesticide application, spreading sludge or ash.

Table 6. High-yield acreage needed to overcome projected supply shortfalls.

Species Group	Proejcted Shortfall (Thousands of Cords per year)	Annual Increment of Intensively managed acreage need to overcome shortfall
Spruce-fir	316	40,000
Tolerant hardwood	599	60,000(add'l)
Intolerant hardwood	529	80,000(add'l)
TOTALS	1,444	180,000 per yr

There are guidelines in place, such as those regulating pesticide application. They may need to be revised, and new guidelines developed from time to time, as new technology comes on line or new problems come to light.

Potential shortfalls

Based on assessments of current and future supply and demand, several timber resources may be in short supply in the future.

White Pine: The forest product most likely in short supply after the year 2000 is white pine sawlogs. Current harvest rates may be more than double the annual sustainable harvest (Table 5b). Assuming a relatively stable demand, Maine mills will be able to supply only about one-half

of the pine lumber they are now supplying. Furthermore, much of the lumber produced will be lower quality, unless more attention is focused on pruning, thinning and protecting younger stands.

Spruce/Fir: The harvest of spruce-fir sawlogs and pulpwood has been abnormally high in recent years, as spruce-budworm damaged trees and the preponderance of mature trees were being removed. A reduction of these elevated harvest rates is now occuring. In the case of spruce-fir sawlogs, a reduction in demand is anticipated as the housing industry plateaus (Balter & Velt Kamp 1987). For pulpwood, the overall demand for pulpwood, both hardwood and softwood, is expected to increase significantly. Although a higher proportion of the demand will be met by hardwood pulp than is now the case, the demand for spruce-fir pulpwood is expected to rise slowly. The net result, however, is a projection that after the year 2000 the sustainable harvest of spruce-fir will only be 46% of current removals.

Hardwoods: The greatest problem presently afflicting Maine's hardwoods is poor quality; 43 percent of the standing volume is in rough, rotten, cull, or dead trees (Mid-cycle Report, 1987). While these trees still have some economic value as pulpwood or fuelwood, they are unsuitable for the more economically attractive, high value-added products, such as veneer or furniture. The problem of poor quality is rooted in traditional harvesting practices that, for economic reasons, removed only the best quality trees, leaving unmerchantable and diseased trees on the site. There has also been a historical bias for managing softwoods while ignoring hardwoods. All this is compounded by a divergence between the economic importance of different hardwood species and their prevalence. Red Maple, for example, is not particularly valuable yet it constitutes 22 percent of the hardwood growing stock (Powell & Dickson, 1984). Red Oak, a more valuable species, comprises only 5 percent.

Although sustainable harvest rates for hardwoods will be higher in the future, a shortfall is predicted due to increased demand. More than enough trees are expected to be available, but it is likely that a high percentage of them will be poorly formed and of the wrong species.

The potential shortfalls identified above reflect a broad, statewide appraisal. Shortfalls in other product groups could occur locally, depending upon such economic factors as demand and transportation costs. For example, even though cedar is abundant in northern Maine, market conditions make it unprofitable to ship it long distances to mills using cedar in southern Maine. The result is a localized shortage, even though statewide there is an adequate supply of cedar.

Finally, technology may help to offset some anticipated shortfalls by making it possible to use substitute species or smaller diameter trees, and of course any changes the general economy could affect the projections upon which this report is based.

Overall, Maine's forest is large and productive. This study has found reason to be concerned about potential shortfalls; but, has also shown that these shortfalls are not as imminent, nor as severe, as previously found in other studies. The Maine forest will continue to be a working forest, managed to proviide the necessary wood while supplying wildlife habitat, recreation, clean water, and a pleasing forest environment.

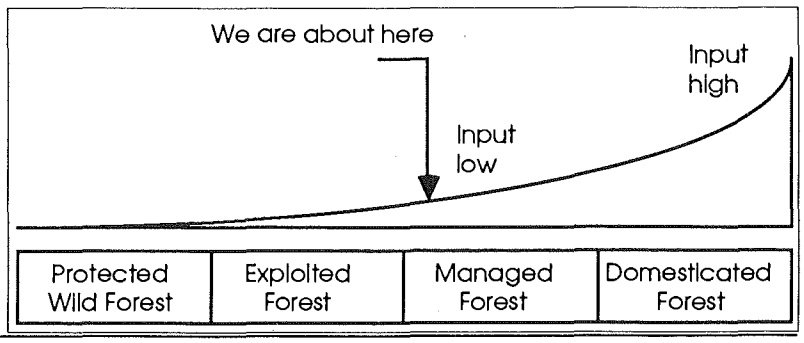


Figure 5. Scale of Forest Management Intensity

Source: Forests of Maine: Yesterday, Today and Tomorrow

WILDLIFE

Current Status

The majority of Maine's wildlife species is forest dependent, and their abundance and diversity are directly related to the condition of the forest. Maine has 59 species of mammals, of which 15 are game or fur bearers that may be legally hunted or trapped; over 340 species of birds, of which some 12 species of waterfowl and 3 species of upland game birds are regularly hunted; and 38 species of amphibians and reptiles. Most of these spend at least a portion of their lives in the forest environment.

The streams, lakes, ponds, and other wetlands that form part of the forest ecosystem provide habitat for over 65 species of fish, approximately a dozen of which are game fish. In addition, there are insects, wildflowers and other iving components of the forest representing tens of thousands of species. All are important members of the forest community; all contribute to the enjoyment and lore of the Maine forest.

Each wildlife species has unique habitat requirements. Some are very specific in their needs, others can thrive in a variety of habitats. Most species are somewhat adaptable, dependent upon certain key elements but able to survive under a range of conditions if those elements are present. Of course, habitats change over time; either through natural processes such as ecological succession or insect and disease outbreaks, or through human action, such as land use conversion or forest harvesting. As habitats change, many current inhabitants adapt and wildlife species not found there previously move in.

In the forest, the availability of each habitat type is correlated to the age class distribution of each of the major forest types. For example, when a deer wintering area (deer yard) becomes overmature or succumbs to the spruce budworm, it no longer provides adequate winter shelter and the deer must go elsewhere to escape deep winter snow. As the old softwoods die, they are replaced by younger trees that will provide browse. The area, while no longer suitable for winter habitat, now provides food for deer during the spring, summer and fall. In time this feeding habitat will grow again into a mature forest, once again providing winter shelter but not food. Simultaneously, the other species occupying the site change: from canopy dwelling warblers in the old forest, to woodpeckers in the dying forest, to shrub-inhabiting sparrows in the regenerating forest (Figure 6).In this way, the remarkable process of succession goes on constantly, although it is often slow and almost indiscernible. In a forest landscape that is naturally varied by forest type and structure, that is periodically influenced by natural and human disturbances, and diverse topographically, the process of succession results in a great deal of natural diversity.

Although present habitat conditions in Maine are good, there is concern that changing forest management activities may result in loss of habitat diversity in the future. On a local or regional scale, wildlife habitat diversity is a concern, suggesting that further study is needed to monitor changes in wildlife habitat.

Some habitats will still be uncommon; they are intrinsically rare. The Maine Critical Areas program has identified the specific habitat types that are in short supply. Old growth forests - stands where the dominant treesare at least 100 years old - and other unique ecological regions, such as Atlantic White Cedar stands, bogs, wooded swamps, and alpine and sub-alpine communities need special protection, because thèse are wildlife habitats that are not generally abundant throughout the state. If sufficient amounts of these unique habitats can be protected, and the rest of Maine's forests

are managed to represent all age classes in all forest types, all existing forest wildlife habitats in Maine will continue to be represented.

The USDA Forest Service report, "Forest Wildlife Habitat Statistics for Maine, 1982" (Brooks et al. 1986) shows that, statewide, there is an adequate supply of most forest habitat types. Certain habitat types may be locally rare or absent, but it is not necessary, or even desirable, for every habitat type to be represented on every individual acre.

For many species the limiting factor is the availability of habitats on a geographic scale that is ecologically attractive. To take an extreme example, if an entire township contained only one or two age classes of trees it would not be attractive to certain wildlife species, even if adjacent townships met their habitat needs, because very few animals ever traverse such a large range. Most animals occupy home ranges of less than twenty acres, depending generally on body size and migratory habits, so their habitat needs must be supplied on an appropriate scale.

Managing primarily for timber resources on every acre will not necessarily ensure availability of all types of habitat, however. Certain habitat types require special consideration to maintain their value to wildlife. As noted above, old growth forests are a rarity in Maine, and may require restrictions on harvesting to preserve their ecological character. Wetlands, even though they are protected by state laws, are being lost at an alarming rate. (Development, not commercial forestry, is the chief culprit.)

Riparian zones - the lands bordering rivers, lakes, and wetlands - provide travel corridors, winter cover, and access to water and so are extremely important to nearly all wildlife species. These areas need some harvest restrictions, but also must be periodically regenerated through controlled cutting to ensure their continuity over time.

Specific wildlife management practices have been developed for deer wintering areas, snags and den trees, mast production, openings and forest edges, seeding of log landings, and waterfowl nest boxes. The Maine Chapter of The Wildlife Society and the University of Maine's Cooperative Extension Service are preparing a guidebook explaining how to integrate these habitat protection and enhancement techniques into forestry operations.

The Maine Department of Inland Fisheries and Wildlife has determined the status of most of the wildlife species in Maine (Table 7). Some require special population management and habitat protection considerations. The Department has also prepared a series of assessments and strategic plans for the principal game and fur bearing animals and for two of Maine's endangered species, with work continuing on other endangered and nongame species. For game species, the plans outline how populations of deer and other species should be managed to sustain annual hunting. The Maine Critical Areas Program, The Nature Conservancy and the Maine Audubon Society are working to identify endangered plants and invertebrates and their critical habitats.

Supply and Demand

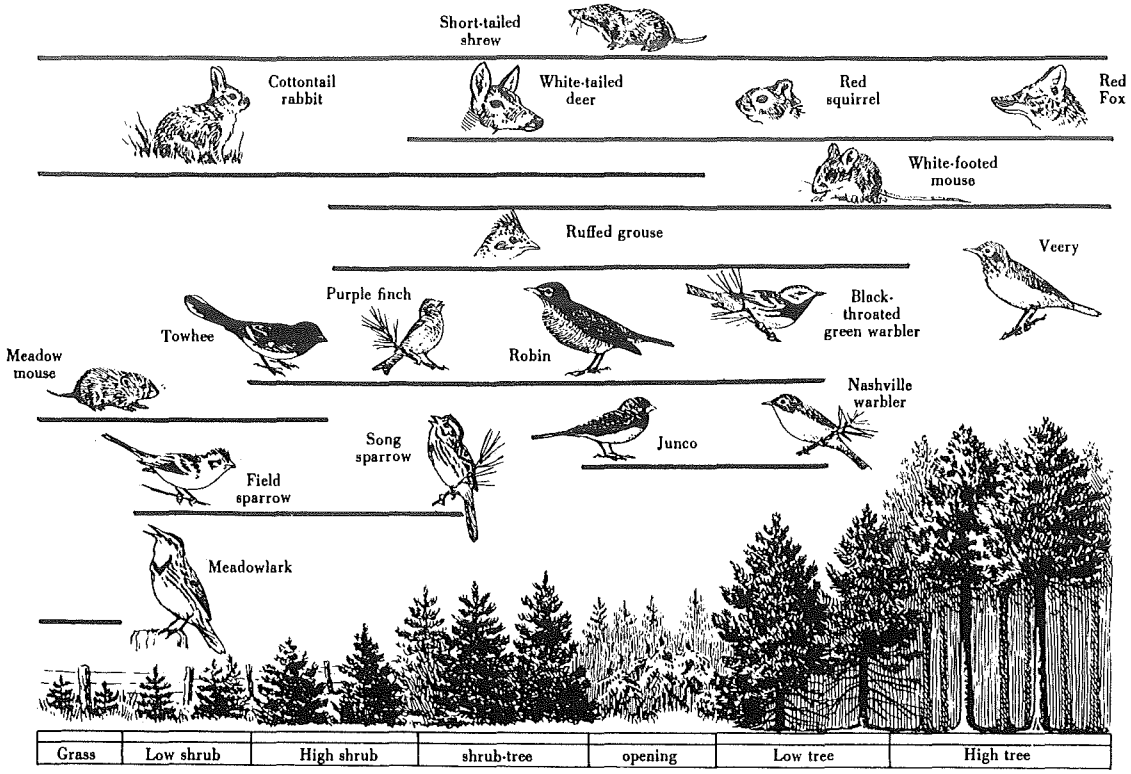
It is difficult to measure the supply of wildlife resources accurately. Reliable census data exists for only the most important game animals and a handful of endangered species, and population counts for most of Maine's 500 plus vertebrate species would be extremely difficult to secure. Populations may also fluctuate greatly, depending upon natural conditions such as food and habitat availability or winter severity. For example, the white-tailed deer population in Maine peaked in the 1950's as many old farms reverted back to forest. In the early stages of this succession, an abundant food supply adjacent to woodlands and adequate wintering areas created favorable conditions

Table 7: Forest associated wildlife species in Maine. [1]

Game Species[2]	Endangered[3] Species	Threatened[4]	Special Concern[5]	Protected	Unprotected
Mammals		Canada lynx	New England		all other species
White--tailed deer		northern bog lemming	cottontail		(40 species)
moose					
black bear					
showshoe hare					
gray squirrel					
fisher					
pine marten					
river otter					
mink					
weasel					
muskrat					
beaver					
red fox					
bobcat					
coyote					
raccoon					
Birds					
waterfowl (10 species)	bald eagle	golden eagle		native species (non game) (250 species)	non-native (introduced)
	peregrine falcon				rock dove
woodcock					starling
ruffed grouse					house sparrow
wild turkey					
crow					
Amphibians & Reptiles	box turtle	Blanding's turtle	ribbon snake		
	black racer	Spotted turtle			all other species (29 species)
Fish					
brook trout	shortnose sturgeon		Atlantic sturgeon		all other species (50 species)
brown trout					
rainbow trout			Arctic charr		
lake trout					
Atlantic salmon					
landlocked salmon					
smallmouth bass					
white perch					
yellow perch					
rainbow smelt					
pickerel					
northern pike					

1. Those species that spend at least a part of their lives in the forests or associated aquatic ecosystems.
2. Those species that may be legally hunted, trapped or fished during specified open seasons.
3. Any indigenous species in danger of extirpation or any federally listed endangered species.
4. Any indigenous species which is likely to become endangered or any federally listed threatened species.
5. Any indigenous species that could become threatened because it ; is suffering a noncyclic population decline, or occurs in precariously small numbers, or has a restricted distribution or specialized habitat requirement.

Figure 7.



Wildlife succession as an old field grows into a coniferous forest in Maine. Some species appear and others disappear as habitat changes. Other species are common to all stages.

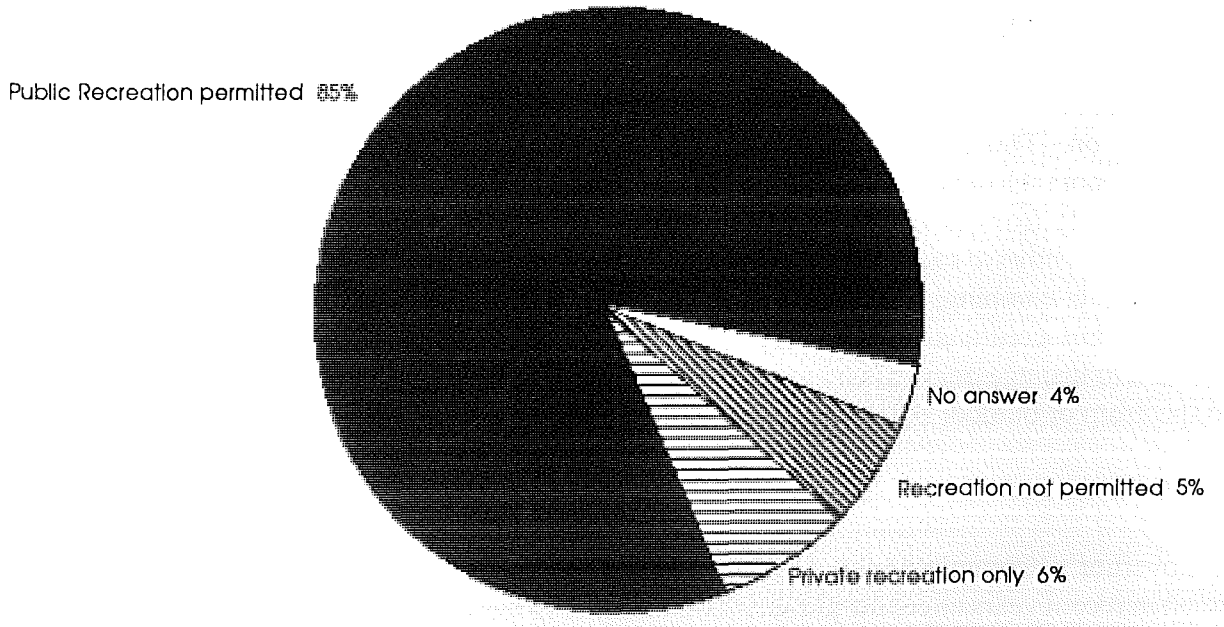
RECREATION

Current Status

The forest supports a wide range of recreational and tourism activities which are both important to Maine's economy and vital to the quality of life we all enjoy. Camping, snowmobiling, cross-country skiing, canoeing, hiking, bird watching, wildlife appreciation, and photography contribute about $500 million annually to the economy, while hunting and fishing contribute an additional $200 million (Boyle, et al. 1987). Traditionally, these forest recreation activities have been enjoyed by most residents and thousands of visitors.

Maine landowners have long believed that recreation is compatible with forest management, and so have shared their land freely with recreationists (Figure 8). Although the majority of the forest in Maine is privately owned, there is a deeply rooted pattern of public recreational use of the resource. More than 8.9 million acres, 99.9 percent, of privately owned industrial forest lands are open for recreation, either free of cost or for a modest fee Maine Commission on Outdoor Recreation, 1987). Historically, these uses have been low impact, dispersed activities such as hunting, fishing, canoeing, and primitive camping. As long as the number of participants was low, there were few conflicts with forest landowners. As population has increased, however, the demand for recreation has likewise increased at about five percent a year (Bureau of Parks and Recreation, Maine Department of Conservation). At the same time, the proliferation of logging roads has enabled recreationists to reach remote areas. Regrettably vandalism and abuse of private property also increased at the same time.

Figure 8. Private ownership available for public recreation.



Source: Forest-land Owners of Maine, 1982.

New forms of recreation, such as motorized all-terrain vehicles, also brought recreationists into more frequent conflict with forest landowners- and other recreationists. In recent years, as the number of recreationists on private land grew landowners resorted to various arrangements to control use and reduce abuse. In 1971, for example, landowners in northern Maine saw the need for cooperative management of these activities and, in 1971, formed the alliance known as North Maine Woods which now encompasses 2.8 million acres. In the Southern half of Maine, where land is in smaller parcels and ownership is diverse, land is increasingly being posted or otherwise restricted to limit use. Since the state of Maine depends upon and promotes tourism and recreation, there is a need for coordination among state agencies and private landowners to minimize these conflicts.

A good deal of forest recreation is closely linked to the use of rivers, lakes and streams. Since the mid 1970's, protection and management of Maine's rivers and lakes has progressed rapidly, culminating recently in the passage of the "Rivers Bill" (An Act to Promote the Wise Use and Management of Maine's Outstanding River Resources) in 1983 and the Land Use Regulation Commission's study, "Maine Wildlands Lake Assessment" in 1987.

Significant recreational uses of rivers and lakes include swimming, boating, rafting, canoeing, and fishing. Unfortunately, water related recreation in the forest is increasingly characterized by overcrowding of popular areas, increased road traffic, improper disposal of human waste, unauthorized camping, litter, erosion, and loss of vegetation at access andtakeout sites. In the past river management plans addressed how to providerecreation opportunities; now they more likely address how best to control use to prevent overcrowding and environmental degradation (Department of Conservation, Bureau of Parks and Recreation, 1987).

Camping is a major recreational activity in Maine's forests. In the unorganized townships, the Maine Forest Service and North Maine Woods, Inc., along with some private landowners, maintain primitive campsites on private lands. On state owned land, the Bureau of Public Lands and the Bureau of Parks and Recreation maintain forest campsites. Very popular sites, such as those along heavily traveled canoe routes and hiking trails, often suffer from overuse.

The Bureau of Public Lands manages the Public Reserved Lands as areas where outdoor recreation can be pursued in the traditional spirit of exploration and discovery. These lands are working, productive forests, but they are also available for public use — particularly primitive, self-reliant recreation. This distinguishes the Public Lands from other public lands in the State, where use is often more closely regulated and supervised. Recreation on the Public Reserved Lands derives principally from the natural values found there: remoteness and natural beauty. Use depends on the ability of visitors to camp, hike, and pursue other activities in a responsiblefashion. Dispersed activities (hiking, camping, hunting, fishing, trapping, cross-country skiing, snowmobiles) are favored, and user conflicts are generally resolved in favor of those uses having the least impact. The decision to manage recreational use in this fashion demonstrates an emphasis on one aspect of a wide spectrum of outdoor opportunities in the Maine forest.

Supply and Demand

The Governor's Commission on Outdoor Recreation (1986) found that thepublic has become concerned in recent years about the prospects for continuing recreational use of private forest lands. Many landowners confronted withvandalism, litter, and other abuse of their land have denied or restricted access to land formerly open to the public for recreation. The rising costof liability

coverage, road maintenance, and litter pickup have caused others to charge fees to cover their expenses.

Vast areas of Maine, formerly accessible only to the most hardy, can now be reached by vehicle with the assistance of new maps and guidebooks. Roads built for forest management purposes have allowed great numbers of recreationists to reach remote areas of Maine, raising the public expectation that these roads will continue to be maintained for public use (Department of Conservation, Bureau of Parks and Recreation, 1987). Furthermore, because these roads are constructed for timber harvesting, they tend to lead visitors into recently harvested areas although most recreation activities require a more mature forest setting and most people prefer to see older stands, not recently cut-over areas. As a result, the road system tends to exacerbate the conflict between recreation and timber harvesting.

Potential Shortfalls

The public has traditionally enjoyed the free and open recreational use of millions of acres of private land throughout Maine. Recreational opportunities in some parts of the state, especially the rapidly developing south, are now being restricted as more people are squeezed onto fewer acres. Posted lands and limited access - along with greater use of available land - combine to lower the quality of some recreational experiences. Even with significant additional public holdings, public use of private outdoor recreation resources—forests, beaches, rivers, lakes, and mountains— will remain essential to meet public recreation demand and protect the Maine heritage of recreation opportunity (Department of Conservation, Bureau of Parks and Recreation, 1987). Users must contribute by cooperating with landowners and preventing vandalism.

The 113th Legislature established the Maine Commission on Outdoor Recreation to "examine the present outdoor recreation needs of the public and to determine whether current public policies properly address that need." This Commission is to file a final report, including any necessary legislation, by January 15, 1988. Its conclusions will have important implications for the Maine Forest.

WATER AND SOIL

The forest ecosystem, in one of its most important functions, collects, filters, and releases water. This process provides a continuous supply of water for drinking, hydro power and other industrial uses, and supports a tremendous fishery. Existing state and federal laws, if properly enforced, will ensure that this vital system remains healthy.

Soil is also an extremely important, yet often overlooked resource. Soil, because it takes so long to form, is essentially a nonrenewable resource.

Current Status

Maine's rivers and lakes are, with few exceptions, cleaner than they were a few decades ago. Unfortunately, some water resources, particularly marshes and coastal wetlands, are being lost despite legislative protection. Southern Maine is losing an unknown quantity of valuable wetlands each year, almost entirely to development. Stronger action is clearly needed to stem this loss, including an inventory of lost wetlands, better enforcement of existing laws, penalties consistent with the magnitude of the violations, and increased awareness of the value of wetlands.

In spite of the abundance of water in Maine, allocation of water resources has become a major concern. Hydro power development, sport fishing, rafting, and canoeing are all appropriate uses of the resource but they place increasing pressure on Maine's rivers and, occasionally, bring participants into conflict with one another.

Forest activities, from recreation to harvesting, can effect the soil base which is vital to a healthy forest. Existing harvesting and road building guidelines are designed to minimize erosion losses and are effective if properly implemented.

Research is underway on the impact of whole tree removal and short-rotation forestry on the soil base and soil fertility, but there are no clear answers yet. Soil compaction during normal harvesting may have a deleterious effect upon the residual stand, killing the fine roots needed by trees for nutrient and water uptake, thereby reducing (at least temporarily) the growth potential of a site.

Supply and Demand

The demand for clean water for drinking and recreation will continue to grow apace with Maine's population. Environmental laws protecting water quality and regulating the development of shore lands are essential to protect this precious resource.

Likewise, guidelines for preventing soil loss through erosion during harvesting and road construction have been prepared by the Maine Department of Environmental Protection and the Land Use Regulation Commission. Careful application of these guidelines throughout the state is desirable.

Potential Shortfalls

Pristine, undeveloped lakes and ponds may become scarce in Maine unless action is taken to preserve some of these undisturbed bodies of water. The Maine Wildlands Lakes Assessment addresses this problem and suggests some solutions.The impact of whole tree and short rotation

harvesting on Maine soils is not fully understood, but some research suggests there could be problems of diminished soil nutrient availability on certain sites. This research should be monitored, and any conclusive results considered, in planning for future protection of forest soils.

GOALS AND ACTIONS

The Forests For the Future Program was instructed to recommend administrative and legislative policies or actions needed to refine or redirect state agency programs and to stimulate or remove obstacles to private sector action in a manner that contributes to an adequate supply of natural resources." Making these recommendations required consideration of goals for Maine's forest resources, goals that expressed a vision of the forest's desirable condition and set acceptable levels of performance to meeting the demands of many interests. The Legislature also directed that "Based on projections of supply and demand, the assessment shall include goals for the supply of forest resources, including, but not limited to, timber, fiber, recreation, water and wildlife."

Forest Goals for Maine

The Forests for the Future Program has sought to articulate a principal goal which represents a broad consensus that Maine's forests can be managed for many uses while at the same time conserving their essential character, their ecological function, natural diversity, aesthetic quality, and inherent productivity.

The forests of Maine must be managed to conserve the land and soil base which supports them; to maintain the forest in a healthy, productive, and diverse condition so that it continues to provide a sustainable yield of forest products, wildlife habitats, recreational experiences, and quality water resources.

More specific goals or objectives are stated for the principal forest components. Each of these objectives can be attained if we maintain our forests in a healthy, productive, diverse, and well managed condition.

Forest Products Goal

The forest of Maine must be managed to provide the variety of raw materials, including timber, fiber, and biomass, that are required by a strong, diverse, and dynamic forest products industry producing value-added products.

The forest products industry, the backbone of Maine's economy, depends on the forest for a steady and reasonably priced supply of raw material to manufacture into sawn products, pulp and paper, panels, energy, and a variety of other products. For this diverse forest products industry to remain strong and responsive to market conditions, this flow of raw material must be sustained by a healthy, well managed forest.

The responsibility for sound forest management lies principally with landowners. Nevertheless, forest management greatly benefits all of society. Landowners must be convinced that managing land is a worthwhile pursuit that benefits them, their community and state.

There are important supporting roles for the forest products industry and government as well. The forest products industry, a direct beneficiary of fully productive woodlands, has a clear self interest in promoting and assisting landowners. The State can influence forest management in a variety of ways: taxation, land use and environmental regulation, labor laws, etc. The State can also take a more direct part in encouraging sound land use, resource management, and economic development.

Wildlife Goal

The forests of Maine must provide a diversity of ecosystems by maintaining balance of evenly distributed stand conditions to sustain viable populations of indigenous species of wildlife for use and enjoyment by Maine's residents and visitors.

No one questions the importance of wildlife. It is an integral part of the ecosystem, an aesthetically pleasing aspect of the forest landscape, and a source of food and sport; its value is universally recognized.

The future of Maine's wildlife resources is closely tied to forest conditions, since the majority of Maine's wildlife species depend on the forest for habitat. Preserving viable populations of Maine's indigenous flora and fauna requires that all habitat types be appropriately represented. A naturally diverse forest comprised of all age classes and all stand types should provide in adequate habitat diversity on a broad geographic basis. There will always be local instances where certain habitat types are absent, specific habitat elements missing or in short supply (e.g., nesting cavities), or special efforts required for maintenance (e.g., deer wintering areas).

Occasionally, protecting or creating habitats causes management or economic hardship for the landowner. Wildlife is a public resource; maintaining wildlife habitat is usually a private responsibility. Sometimes landowners are reluctant to undertake the necessary silvicultural practices without reasonable compensation.While the burden for specific management practices falls to the landowner, the state must participate by preparing guidelines for specific habitat maintenance practices, conducting basic inventory and evaluation on an ongoing basis, and assisting landowners in the woods with the planning and application of management practices. Ensuring adequate wildlife management must be a cooperative effort.

Recreation Goal

The forest of Maine must contribute to the wide variety of recreational and aesthetic experiences associated with the forest

Forest recreation, an integral part of Maine's heritage, is being challenged by the loss of land to development, the restriction of access on some forest land, and the increasing overcrowding caused by more people participating in both traditional and new forms of outdoor recreation. It is clear that the demand for forest recreation will continue to outstrip the capacity of publicly owned lands. This may lead to additional conflict over access control, fees, and other efforts to manage use and assure a qualityexperience

Water and Soil Resources Goal

The forests of Maine must be managed and used in a manner that conserves the quantity and quality of water and soil resources associated with the forest.

Clean, abundant water and productive, healthy soil are essential to the entire forest ecosystem. Existing laws and guidelines protecting soil and water resources need consistent statewide enforcement to be fully effective.

It is clear that private landowners bear a significant responsibility for achieving these forest goals. They must ensure that the forests continue to produce economically valuable forest products and provide clean water and wildlife habitat; at the same time the must maintain an aesthetically pleasant forest available for outdoor recreation. This challenge will only be met through carefully planned, comprehensive forest management. Landowners are direct stewards of Maine's most valuable resource; but, not all responsibility falls on the landowner.

The State shares responsibility for wildlife, water, timber productivity and recreation. Maine citizens are clearly responsible for safe use which abuses neither land nor landowner. In this rich mixture of ownership and responsibility cooperation is the key to the future.Ultimately, we are all stewards of the magnificent Maine Forest, with an obligation to ensure that this forest will continue to benefit the people of Maine forever.

RECOMMENDATIONS

The Legislature directed that recommendations be prepared for state and private actions designed to address the needs identified by the Forests for the Future Study.

"State action recommendations shall be defined in terms of necessary policies, programs, staff and budgetary requirements to achieve specific goals."

"Recommendations for actions on privately held forest lands shall be developed separately for large, industrial ownerships and small, nonindustrial ownerships. These recommendations shall be defined in terms of actions needed to achieve specific goals."

Clearly, the work conducted by the Forests for the Future Program — and the Forest Goals derived from that work — express an intention to continue to benefit from the diverse economic anndd social values the Maine Forest provides. The goals which have been developed are, in effect, a yardstick for measuring desirable forest uses, suggesting ways to avoid wood shortages and enhance the resource. The recommendations that follow represent opportunities for action by all Maine's citizens to meet these challenges.

Public Expectations of Landowners

The need for sound management to maintain and enhance forest productivity, avoid shortfalls and protect resource values will be met primarily by the private sector. The Maine forest is large and diverse, capable of providing a wide variety of products and supporting many uses, but achieving the desired level of performance demands improved management based upon enlightened self interest.

The public interest will be served by private action. Landowners/resource managers therefore need to have a clear understanding of their obligations to society and society's expectations of their management efforts. The public, conversely, needs to understand and appreciate the practices and techniques required to successfully manage forest land.

Three recommendations apply to all forest land owners:

1. Forest landowners must have a sense of land stewardship. Though owners have the right to manage the forest for their own private purposes, they also have an obligation to protect soil and water and ensure forest regeneration that provides timber for future generations
2. Forest landowners have an obligation to comply with all applicable laws and regulations.
3. Forest landowners should work with public and private agencies to achieve public interest objectives in a fair and equitable manner compatible with the landowners' interest.

For the many nonindustrial private woodland owners who are not yet managing their land, it is especially important that they initiate sound management.

1. Clearly identifying the purposes of their ownership and the objectives of their forest activities.

2. Seeking information, advice and professional assistance as needed to ensure that sound management practices are applied.

Recommendations for State Government

1. The State of Maine can help make certain that an adequate level of raw material continues to flow from the predominantly privately owned timberlands, thereby sustaining a strong forest products industry and maintaining the other amenities of the forest environment. The key to sustaining an adequate wood supply is active forest management, the principal responsibility for which lies with landowners. The State can encourage, support, and assist landowners to manage the resource well. Substantial amounts of advice and help are available, but sources for such information are not widely known and there are areas of overlapping responsibilities. Therefore, the MFS will work with other public agencies and private entities to coordinate services and provide a well publicized one-point source of information about forest resource management. This service will be organized and made available by October 1, 1988. The DOC/FFP will fund a study to review forestry related services available, especially to NIPW, and to make recommendations to the MFS as to ways in which these services can be effectively delivered to landowners.

2. Outdoor recreational activities are usually compatible with other forest uses and values. Accommodating the expected growth in outdoor recreational activities, providing access, and managing users are the critical challenges. The state will take several actions designed to contribute to improved management of recreational uses.
   a. The DOC and DIF&W are currently studying ways, within existing programs and responsibilities of enhancing the landowner/land user relationships. Recommendations from these deliberations will be available by May 1, 1988. In addition the Legislative Commission on Outdoor Recreation has made recommendations, which when implemented, may require action by the DOC and other agencies. The DOC can assist in fostering public acceptance of reasonable user fees and other legitimate measures to manage recreatioonal use, as recommended by the Commission on Outdoor Recreation.

   b. The Department of Conservation, Bureau of Parks and Recreation, when requested will assist private landowners/managers in

identifying significant recreational resources on their lands and in preparing management plans for conserving these resources and making them available for public use.

c. The MFS will provide information to the public at its regional offices concerning public recreation opportunities and landowner policies and programs.

3. To ensure that forests are managed to maintain and enhance wildlife value, landowners and resource management professionals must be informed of the values of wildlife habitat and appropriate techniques for its management. The MFS, in cooperation with IF&W and the Cooperative Extension Service, will prepare and run a series of training sessions to inform foresters, landowners, loggers and others about how tto apply the management practices contained in the new Forest Wildlife Management Handbook prepared by the Cooperative Extension Service. The first session is scheduled for June with additional regional sessions to be held during 1988 and 1989.

There is a need to continue inventories, evaluations and management studies for the specific wildlife habitats that require special consideration, such as deer yards, eagle nests, riparian areas, and significant fisheries. These tasks are the responsibility of IF&W, but the information gathered needs to be conveyed to landowner/managers. The MFS will help in providing this information to appropriate people.

4. Ensuring the protection of soil and water remains an essential state function. There is some concern that non-point source pollution from forestry activities in the organized towns of the state may be an inadequately controlled problem of some magnitude. In response, all appropriate DOC field people will be provided basic training on environmental regulations. They will serve as information contacts for forest operators and will alert owners and operators to potential problems. Additionally, DOC field people will warn operators that are potentially in violation and will report them promptly to regulating authorities. DOC staff will be trained during June and July, 1988, and will be functioning in this role by Fall of 1988.

To aid in the identification of active timber harvesting activities, logging contractors should be required to file a notification with the Maine Forest Service. The Maine Forest Service can use this information to direct the work of DOC personnel, and to obtain statistical data on harvesting. Legislative approval will be needed, plus the financial resources to collect and process the information. A specific plan of action will be

developed by July, 1988, and enabling legislation prepared by September, 1988.

Finally the DOC, and specifically the MFS and the LURC, will continue to work with the DEP to revise and update the States' Water Quality Plan and implementat its recommendations.
This plan is due by April 1988, with additional activities to follow.

5. Reliable forest resource supply and demand data is essential for both public and private planning and development of public policy. The MFS is presently reviewing and revising its legislatively mandated procedures for collecting data on timber harvesting and stumpage values, mill consumption, silvicultural activities and biomass harvesting activities. This data is analyzed and distributed to interested parties. A working plan to improve the accuracy and usefulness of this information will be developed by August, 1988. Portions of the task can be accomplished under present statutes and budgets. The work plan will determine additional financial and staff needs.

   The MFS will also work closely with the USFS in planning for the 1990 forest resource survey, identifying data shortages and making certain the information collected is useful to Maine. Forest data will be reported by the DOC in an annual report on the status of the forest resource which is based upon the information collected by the MFS, plus data from other sources such as IF&W and the State Planning Office. Key trends of forest health, productivity and use will be reported.

6. State government has the responsibility to create and maintain consistent forest policy supporting sound forest use. To achieve this objective, there is a need to maintain forestry planning programs that will coordinate and guide the actions of the State relative to forest resources.

   The Department of Conservation through its various Bureaus and programs will be responsible for implementing the recommendations of this report. Where other agencies are involved, the Department will coordinate with them, and the inter-agency programs through the State Planning Office.

   The CFAC will continue essential role the a forestry planning process, representing the public in reviewing issues and suggesting solutions. The CFAC will meet bimonthly to review progress on ongoing studies, discuss and resolve issues, and provide

advice.

The Forest for the Future Program will continue to study and monitor forest resources, identify goals and objectives, and review policies that pertain to the forest resource. A work program will be developed by March 31, 1988 to include:

a. Development of objective informational reports on subjects such as silvicultural systems and their impact on productivity, resource availability, loss of forest land to development, and landowner reluctance to harvest; and ways to ensure sound forest practices, such as landowner incentives or forest practices legislation.

b. A five year schedule for study and discussion leading up to the required review and revision of this report in 1993.

A VISION OF MAINE'S FUTURE FOREST

The forest of Maine will not look dramatically different in the future than it does today. It will continue to be diverse in ownership, forest types, and age classes. The ecological forces that shape the forest will remain the same, as will the human activities of managing, harvesting, and recreating. The technology will be different. There will probably be a little less forested land, especially in Southern and Central Maine, but this may be offset by an increase in Northern Maine as some of the abandoned fields and farms revert back or are planted into new forest stands.

Some greater portion of the forest, particularly the Spruce-Fir component of the industrial forest, will be more intensively managed to increase yields. This intensively managed forest will be characterized by stands of even age and uniform composition. It will be entered frequently and harvested on a relatively short rotation, and it will be recognizably different. It will still represent only a small fraction of the total forest area, but it will be essential for meeting the needs of Maine's forest industry.

The rest of the forest will not have changed much. The trees will, in general, be younger and therefore thriftier and more rapid growing, but they will still harbor the same array of wildlife and will even have more of the key wildlife needs—den trees, good mast and browse production, seeded landings and roadsides, and an interspersion of successional stages to provide diverse habitat. Special management will be applied to deer wintering areas and riparian zones so that these important wildlife areas will continue to provide for wildlife while still yielding timber and recreational opportunities.

Forest products will continue to be harvested from both industrial and nonindustrial ownerships, but these harvests will follow management plans that meet clearly defined landowner objectives and balance public interest. Harvests will be carefully planned to ensure that a regenerating forest will provide future harvests, as well as wildlife habitat and recreation.

Lakes, ponds, rivers, mountain vistas, and other areas that have high scenic and recreational value will continue to provide opportunities for Maine residents and visitors to hunt, fish, hike, camp, canoe, or simply reflect upon and enjoy the natural beauty of Maine. Some of these areas will be managed for timber, so harvests will occassionally interrupt their tranquility, but these will be short term interruptions. Many of these areas will be left undisturbed. A few will inevitably be lost to the general public and end up in private development with restricted access. Other unique areas, such as critically endangered or fragile habitats, will be protected and, when necessary, managed to ensure their survival. Most privately owned forest land will still be available for low impact forms of recreation, although user fees will be charged in many areas. Access will have to be more tightly controlled on some popular recreational sites. Large, undeveloped tracts dedicated primarily to wilderness and dispersed recreation will probably be available only within the public sector, i.e., parts of the public reserved lands, partsof the White Mountain National Forest, and Baxter State Park.

A majority of Maine landowners will recognize their responsibility as stewards of an important resource and will actively seek assistance in managing their land. As a result, more

forest land, both in the industrial and nonindustrial sectors, will be under some type of management, though it will not necessarily be primarily for timber production.

On a statewide basis, all forests will be in a more balanced aged class distribution older age classes will be present, but will represent a relatively small portion of the total. All wildlife habitats will be present on a scale that ensures the survival of all indigenous species, though some rare species will continue to be scarce or locally absent. Healthy populations of game species will provide sport as well as well as viewing pleasure to hunters and non hunters alike. Maine's lakes and rivers will be clean and free from any long-term pollution and siltation problems, though occasional inadvertent contamination will probably continue on a small scale. Forest soils will continue to be productive. They will be protected from erosion and abuse, and on intensively managed sites may be supplemented by the application of commercial fertilizers and soil conditioners or approved sludge and ash.

For the most part, Maine's forest will continue to be a working forest, providing jobs for people, raw materials for industry, and habitat for wildlife; not much changed from what it is today. The big difference will be the realization by a majority of Maine citizens that the forest has limits; that in order to provide all that society demands, it must be carefully tended; and that it is their responsibility to ensure that the principles of conservation and stewardship remain an integral part of Maine's heritage.

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